

## A CASE OF BASOPHIL LEUKEMIA IN A DOG AND ITS DIFFERENTIATION FROM A CASE OF DISSEMINATED MALIGNANT MASTOCYTOMA

Mitika K. HAGIWARA \*  
Eduardo H. BIRGEL \*  
Ricardo C. do AMARAL \*  
Luiz G. M. ROSENFELD \*\*

RFMV-A/3

HAGIWARA, M.K.; BIRGEL, E.H.; AMARAL, R. C. do; ROSENFELD, L.G.M. *A case of basophil leukemia in a dog and its differentiation from a case of disseminated malignant mastocytoma.* Rev. Fac. Med. vet. Zootec. Univ. S. Paulo, 14(1):31-36, 1977.

**SUMMARY:** Two cases of malignant disturbances on the production of basophils and mast cells were reported in dogs. The former was characterized by the presence of intensive basophilia with basophils of immature aspects and myeloid metaplasia foci within liver, spleen and lymph nodes in wich predominated basophils with the same aspects of the circulating ones. In the second case mast cells were predominant in the lymph nodes and metastatic foci associated with a slight increase in normal basophils and mast cells in the peripheral blood. The basophils in the first case and the mast cells in the second were differentiated by morphological and histochemical methods.

**UNITERMS:** Basophil leukemia \*; Neoplasms, dogs \*; Mastocytoma, malignant \*.

### INTRODUCTION

Blood changes as well as alterations in the hematopoietic organs may take different forms and also show some aspects that are so far unknown. The occurrence of basophil leukemia as a clinical entity in man has been reported (QUATTRIN et al<sup>7</sup>, 1959; PENNACHIO & MELE<sup>6</sup>, 1971). The basophilic form of myeloid leukemia is of rare incidence in domestic animals (KAMERMANN-LUSCHER<sup>5</sup>, 1966).

Two cases, one of a malignant disturbance in the production of basophils and another of mast cell neoplasia in the dog is here reported and an attempt was made to compare these two pathological entities.

### MATERIAL AND METHODS

#### 1. Description of the cases

Case nº1. A mixed breed 4 years old female dog presented sudden vomiting of unknown origin and loss of weight. The clinical examination showed signs of severe dehydration, a slight hypotermia (37°C) and enlargement of spleen, liver and mesenteric lymph nodes. The dog was submitted to radiological and laboratory examinations and when the clinical symptoms could no more be controled the animal was killed.

Case nº2. A mixed breed 6 years old male dog presented nose edema which had continous crisis of amelioration and

\* Department of Pathology and Clinics, School of Veterinary Medicine University of São Paulo, Brazil.  
\*\* Institute of Cardiology of São Paulo, Brazil.

remission since 6 months before the first clinical examination. When examined, the animal showed edema of the soft parts of the head and bilateral enlargement of the lymph nodes of the cervical region. The hemogram as well as a biopsy of the affected lymph nodes were performed. During the following two months of observation, the dog showed difficulties of deglutation ematiation and small nodules in the skin of the thoracic region appeared. The animal had a natural death.

## 2. Methods

Blood examination was made according to the usual methods. Blood smears were stained by the following techniques: May - Gruenwald - Giemsa modified technique (ROSENFELD<sup>8</sup>, 1947), toluidine blue 1 per cent, peroxidase and alkalyne phosphatase (RANKEL & REITMANN<sup>3</sup>, 1963).

The animals were submitted to a complete post-mortem examination when fragments of organs in both cases were fixed in 10 per cent formalin or 0.5 per cent cetyl trimetil amoniun bromide (CTAB), embedded in paraffin and 5 sections obtained. The following histological methods were used: H.E., 0.9 per cent toluidine blue in 0.5 per cent acetic acid and Alcian blue ph 2,5 followed by Periodic Acid - Schiff (PAS) method (VIALLI<sup>9</sup>, 1955).

## RESULTS

Case nº 1. Results of the blood count of the first case are shown in TABLE 1. Leukocytosis and basophilia were observed and the circulating basophils showed immature aspect, with rough cytoplasmatic granules which masked the nucleus of the cells. (PHOTO 1). When stained with toluidine blue these granules were deeply metachromatic and both, peroxidase and alkalyne phosphatase determination resulted negative. The myelogram showed a 3:1 M:E relation with evident predominance of immature cells of the granulocytic series.

Cells with basophilic cytoplasmatic granules were detected in a proportion of 3 per cent. The histological study of the liver, spleen and lymph nodes showed multiple foci of myeloid metaplasia comprised of basophils which were easily characterized by the toluidine blue (PHOTO 2) or alcian blue - PAS (PHOTO 3) methods. The nucleus of these cells resembles those of the cells from the myeloid series.

Case nº 2. In this case, eosinophilia and basophilia were a constant feature during the entire development of the disease. These cells when examined in blood smears presented a normal morphological aspect. The results of blood count are shown in TABLE 2. The myelogram showed hypercellular bone marrow production with an increase in the neutrophilic, eosinophilic and basophilic granulopoiesis. Several mast cells were also observed in these preparations. The lymph node puncture revealed massive infiltration of both mast cells and eosinophils in addition to a small quantity of neutrophils and fibrin deposition.

The tumoral mass in the cervical region which committed the retropharyngeal and cervical lymph nodes was compact and yellowish when sectioned. The small nodules disseminated throughout the skin at the cervical and thoracic region had similar macroscopic aspect of the primitive tumoral mass. Metastasis in the myocardium and liver were also found. The histological study of the affected lymph nodes stained by the H. E. method revealed a sarcomatous infiltrative process. A granular metachromatic material was detected in the cytoplasm of these cells when the toluidine blue method was used. Both PAS and alcian blue reactive granules were seen in the cytoplasm of these cells.

## DISCUSSION

Basophils seen in large number in the blood smear of the first animal had morphological characteristics that easily permitted their distinction from typical basophils which appear in the circulating blood of the dog. Basophilia in man is

frequently associated with chronic myeloid leukemia (JARANOWSKI<sup>4</sup>, 1972). According to QUATRIN et alii<sup>7</sup> (1969), that studied basophil leukemia in a rather intensive basis it is possible to differentiate this process from chronic myeloid leukemia based on the relationship between the basophil/neutrophil counts in the blood and also on the assumption that these differences reflect the bone marrow production of these cells. Nevertheless, in our case the number of the bone marrow basophils did not correlate to the number of these cells in circulation. This fact strongly suggests that the altered basophils found in circulation would have come from the proliferative foci of basophils in the liver, spleen and mainly in the lymph nodes. This unexpected observation deserves further investigation in order to clarify the pathogenesis of this process.

Our results differ from those of ALROY<sup>1</sup> (1972) who presented a case of basophil leukemia in a dog with only 1 per cent of circulating basophils and a predominance of immature granulocytes beside few basophils in bone marrow and other organs.

Basophil leukemia and systemic mastocytosis in the dog may have similarities which could be of interest to compare. PENNACHIO & MELE<sup>6</sup> (1971) studied an intermediate form between systemic mastocytosis and promyelocyte leukemia, discussing the morphological similarities of both cells and the difficulties in differentiating them. The mastocytoma and

mastocytosis occur with certain frequency in dogs, but the latter is always associated to the presence of primary tumor in the skin. The differential diagnosis between mastocytosis and basophil leukemia was established by the non existence of any nodules resembling mastocytoma in the skin or other organs of the first case. Beside this, some differences between basophils and mast cells related to morphological aspects, mainly the form of nucleus and histochemical characteristics, were established (PHOTO 4). The eosinophilia and basophilia observed in the second case during the whole development of the disease were constant and both cells presented normal morphological aspect. Mast cells were observed in the peripheral blood of this animal, mainly at the final stage of the disease and the circulating cells maintained no morphological similarities to basophils. According to ASBOE-HANSEN<sup>1</sup> (1960), basophilia associated to mastocytosis could be explained through the basophil-mast cell unitary system theory. Also PENNACHIO & MELE<sup>6</sup> (1971) discussed the possibility of the sole origin of both cells. However the cases now presented suggest two different origins for these cells, since in the first case there was a predominance of immature basophils in the peripheral blood and within the liver, spleen and mesenteric lymph node parenchima, while in the second case a predominance of mast cells in metastatic foci, associated with a slight increase in normal basophils and appearance of mast cells in the peripheral blood was clearly shown.

**TABELA 1 – Hemogram results from the dog with basophil leukemia (CASE nº 1).**

<b>BLOOD \ DATE</b>	<b>09/11</b>	<b>09/13</b>
<i>Erythrocytes (million/cu. mm)</i>	$4,5 \times 10^6$	$4,3 \times 10^6$
<i>Hemoglobin (gm/100 cc)</i>	12,0	10,0
<i>P.C.V. (cc/100 cc)</i>	40,0	33,0
<i>Leucocytes</i>	150.000	115.000
<i>Band neutrophil</i>	15	11
<i>Neutrophil</i>	48	55
<i>Eosinophil</i>	1	0
<i>Basophil</i>	22	16
<i>Lymphocyte</i>	1	1
<i>Monocyte</i>	13	18

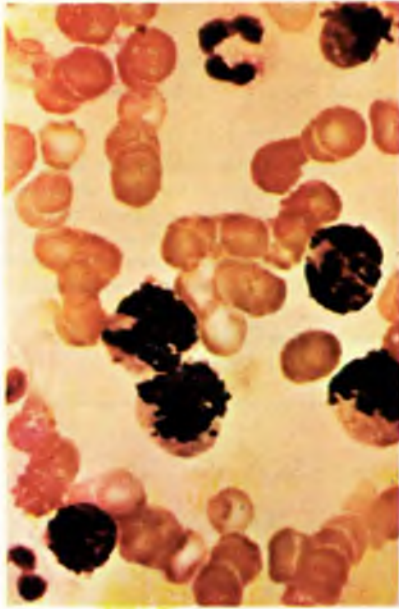
*Note: Anomalous basophils in various badly defined maturation stages, a few with rough granules fully masking the nucleus. Steining with toluidine blue showed metachromasia. On the 09/13 smear the more immature aspect predominates.*

**TABELA 2 – Hemogram results from the dog with mastocytoma (CASE nº 2).**

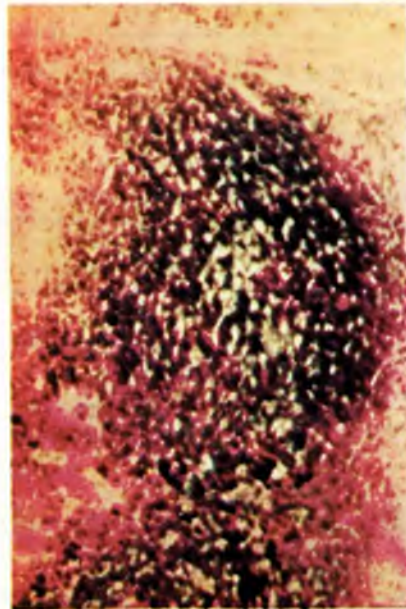
<b>BLOOD DATA \ DATE</b>	<b>08/16</b>	<b>09/02</b>	<b>09/16</b>	<b>09/26</b>	<b>10/04</b>	<b>10/09</b>	<b>10/16</b>	<b>10/21</b>
<i>Erythrocytes (<math>10^6</math>/cu mm)</i>	7.5	6.4	6.1	6.5	6.5	6.5	4.5	3.9
<i>Hemoglobin (gm/100 cc)</i>	13.0	13.0	12.5	11.0	12.5	12.8	10.0	8.0
<i>P.C.V. (cc/100 cc)</i>	40.0	39.0	35.0	35.0	35.0	37.0	30.0	26.0
<i>Leucocytes (<math>10^3</math>/cu mm)</i>	11.7	17.6	26.6	30.6	35.0	58.0	16.4	25.7
<i>Metamyelocytes</i>	0	0	0	0	0	2	2	0
<i>Band-neutrophil</i>	0	0	2	3	7	11	11	3
<i>Neutrophil</i>	49	71	73	60	62	47	73	83
<i>Eosinophil</i>	11	15	14	22	24	13	8	3
<i>Basophil</i>	3	4	2	2	1	4	1	2
<i>Lymphocyte</i>	28	9	8	9	5	22	3	4
<i>Monocyte</i>	9	1	1	4	1	1	2	5

*Note: Presence of band and metamyelocyte eosinophils with little granulation. Basophils also with little granulation starting on 09/26. Anisocytosis, hypocromia and basophilia of erythrocytes were observed.*

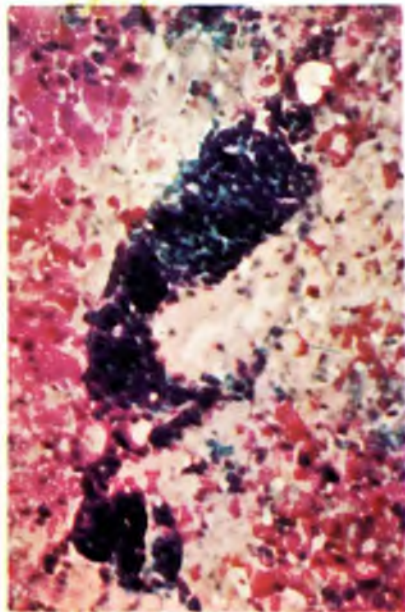




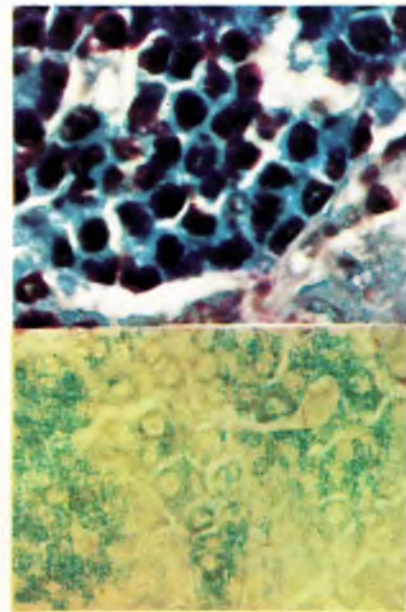
*PHOTO 1*



*PHOTO 2*



*PHOTO 3*



*PHOTO 4*

- PHOTO 1* — Circulating basophils in the first case. Rosenfeld staining.  $\times 1000$ .  
*PHOTO 2* — Basophil myeloid metaplasia foci within lymph node. Toluidine blue staining.  $\times 100$ .  
*PHOTO 3* — Basophil myeloid metaplasia foci within liver. Alcian blue + PAS staining.  $\times 100$ .  
*PHOTO 4* — Morphological and histochemical aspects of basophils (Basophil leukemia) and mast cells (Mastocytoma). Alcian blue + PAS staining.  $\times 600$ .

HAGIWARA, M.K.; BIRGEL, E.H.; AMARAL, R.C. do; ROSENFELD, L.G.M. *Leucemia basofílica em um cão e sua diferenciação de um caso de mastocitoma maligno.* Rev. Fac. Med. vet. Zootec. Univ. S. Paulo, 14(1):31-36, 1977.

**RESUMO:** *Dois casos de distúrbios malignos na produção de basófilos e mastócitos foram relatados em cães. O primeiro foi caracterizado pela presença de intensa basofilia, sendo os basófilos circulantes de aspecto imaturo e existência de focos de metaplasia mieloide no fígado, baço e linfonodos nos quais predominavam basófilos com o aspecto citado. No segundo caso predominavam os mastócitos nos linfonodos e focos metastáticos além de ligeira basofilia e mastocitose. Os basófilos no primeiro caso e os mastócitos no segundo foram diferenciados através da morfologia e características histoquímicas.*

**UNITERMOS:** *Leucemia basofílica \*; Mastocitoma maligno \*; neoplasias, cães \*.*

#### REFERÊNCIAS BIBLIOGRÁFICAS

- 1 - ALROY, J. Basophilic leukemia in a dog. Vet. path., 9:90-95, 1972
- 2 - ASBOE-HANSEN, G. Urticaria pigmentosa with generalized tissue mastocytosis and blood basophilia. Arch. Derm., 81:198-202, 1960.
- 3 - FRANKEL, S. & REITMANN, S. *Gradwohl's clinical laboratory methods and diagnosis.* 6.ed. Saint Louis, C.V. Mosby, 1963.
- 4 - JARANOWSKI, J. Basophil leucocytes of peripheral blood in various pathological conditions. Pol. med. J., 11:91-9, 1972
- 5 - KAMMERMANN-LUSCHER, B. Basophil leukosis, casereport. Berl. Munch. tier-aerztl. Wschr., 79:459-64, 1966
- 6 - PENNACHIO, L. & MELE, G. Forma intermedia fra leucemia acuta a promielociti basofili e mastocitosi sistemica. Minerva Med., 62:3747-59, 1971.
- 7 - QUATRIN, N.; DINI, E.; PALUMBO, E. *Leucemie basophile.* Pisa, Omnia Medica, 1959.
- 8 - ROSENFELD, G. Corante pancrômico para hematologia e citologia clinica. Nova combinação dos componentes do May-Gruenwald e do Giemsa num só corante. Mem. Inst. Butantan, 20:329-34, 1947
- 9 - VIAELI, M. Técnica per l'uso contemporaneo in istochimica del alcian blue e della reazione di Hotchkiss. Arch. zool. ital., 40: 399-407, 1955.

Recebido para publicação em 17-3-77  
Aprovado para publicação em 3-8-77